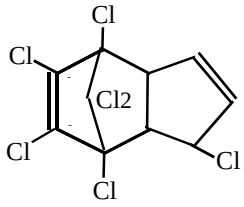
# HEPTACHLOR

Heptachlor is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 76-44-8

Molecular Formula: $C_{10}H_5Cl_7$




Heptachlor is a white to light tan waxy solid with a camphor-like odor. It is insoluble in water and soluble in xylene, hexane, and alcohol (Sax, 1987; HSDB, 1991).

**Physical Properties of Heptachlor**

Synonyms: 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene; E 3314; Velsico 104; Drinox; Heptamul

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|---|---|
| Molecular Weight: | 373.35 |
| Boiling Point: | 145 °C at 1.5 mm Hg |
| Melting Point: | 95 - 96 °C |
| Density/Specific Gravity: | 1.57 at 9 °C (water = 1) |
| Vapor Pressure: | $3 \times 10^{-4}$ mm Hg at 25 °C |
| Log Octanol/Water Partition Coefficient: | 5.27 |
| Water Solubility: | 0.18 mg/L |
| Conversion Factor: | 1 ppm = 15.27 mg/m$^3$ |

(Howard, 1990; HSDB, 1991; Merck, 1983; U.S. EPA, 1994a)

## SOURCES AND EMISSIONS

A. Sources

Heptachlor was registered for use as a pesticide; however as of January 1, 1988, it is no longer registered for pesticidal use in California (DPR, 1996).

B. Emissions

No emissions of heptachlor from stationary sources in California were reported, based on data obtained from the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of heptachlor was found in the readily-available literature.

## AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of heptachlor. However, ambient air concentrations for heptachlor at various locations throughout the United States were monitored by the United States Environmental Protection Agency (U.S. EPA). These locations reported an overall mean concentration of 7 nanograms per cubic meter ($ng/m^3$) between 1987-88 (U.S. EPA, 1993a).

## INDOOR SOURCES AND CONCENTRATIONS

According to the Nonoccupational Pesticide Exposure Study conducted by the U.S. EPA and published in 1990, levels of 32 pesticides were measured in 24-hour samples obtained inside and outside homes located in 2 cities. Approximately 70 homes in Jacksonville, Florida were monitored in each of 3 seasons, and approximately 50 homes in Springfield/Chicopee, Massachusetts were monitored in each of 2 seasons. Mean indoor concentrations of heptachlor ranged from 72.2 to 163 $ng/m^3$ in Jacksonville and from 3.6 to 31.3 $ng/m^3$ in Springfield/Chicopee. For both cities, average indoor heptachlor concentrations were higher than corresponding outdoor concentrations (Immerman and Schaum, 1990).

## ATMOSPHERIC PERSISTENCE

Heptachlor is expected to exist almost entirely in the vapor phase in ambient air. Using an estimated rate constant for the gas-phase reaction of heptachlor with the hydroxyl radical (Kwok and Atkinson, 1995), the calculated half-life and lifetime of heptachlor are about 5 hours and 7 hours, respectively (Atkinson, 1995). Physical removal from the air by wet deposition (rainfall and dissolution in clouds, etc.) is limited, due to heptachlor's low water solubility and the short atmospheric residence time (Howard, 1990).

## AB 2588 RISK ASSESSMENT INFORMATION

Since no emissions of heptachlor from stationary sources in California have been reported under the AB 2588 program, it was not listed in any of the risk assessments reviewed by the Office of Environmental Health Hazard Assessment.

## HEALTH EFFECTS

Probable routes of human exposure to heptachlor are inhalation, ingestion, and dermal contact

(HSDB, 1991).

Non-Cancer: Heptachlor disrupts the central nervous system (CNS) resulting in CNS excitation and seizures. Respiratory depression may occur concurrently with seizures (HSDB, 1991). Skin absorption is rapid and has caused convulsions and death (U.S. EPA, 1994a).

The U.S. EPA has established an oral Reference Dose (RfD) of $5 \times 10^{-4}$ milligrams per kilogram per day for heptachlor based on liver weight increases in male rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects. The U.S. EPA has not established a Reference Concentration (RfC) for heptachlor (U.S. EPA, 1994a).

Limited information is available on adverse human reproductive effects caused by heptachlor. Adverse developmental and reproductive effects have been seen in test animals after oral exposure. These include primarily decreased postnatal survival, but also fetal resorptions and failure of animals to reproduce (U.S. EPA, 1994a; ATSDR, 1993g).

Cancer: Information from human studies on the carcinogenicity of heptachlor has been found to be inconclusive. Liver tumors were seen in mice exposed to heptachlor via ingestion. The U.S. EPA has classified heptachlor as Group B2: Probable human carcinogen. The U.S. EPA calculated an inhalation unit risk estimate of $1.3 \times 10^{-3}$ (microgram per cubic meter)$^{-1}$. The U.S. EPA estimates that if an individual were to breathe air containing heptachlor at $8.0 \times 10^{-4}$ micrograms per cubic meter ($\mu g/m^3$), over an entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified heptachlor as Group 2B: Possible human carcinogen (IARC, 1991).

The State of California has determined under Proposition 65 that heptachlor and heptachlor epoxide are carcinogens (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is $1.6 \times 10^{-3}$ (microgram per cubic meter)$^{-1}$ for heptachlor, and $3.7 \times 10^{-3}$ (microgram per cubic meter)$^{-1}$ for heptachlor epoxide (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 $\mu g/m^3$ of heptachlor is estimated to be no greater than 1,600 in 1 million, and for heptachlor epoxide, no greater than 3,700 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 5.7 (milligram per kilogram per day)$^{-1}$, and for heptachlor epoxide is 130 (milligram per kilogram per day)$^{-1}$ (OEHHA, 1994).